AMENDED CLAIMS

[received by the International Bureau on 20 December 2002 (20.12.02);
original claims 1-24 replaced by new claims 1-24 (5 pages)]

NEW CLAIMS

1. A long superconductor, e.g. a superconducting tape or wire, with at least one polycrystalline superconducting compound deposited on a substrate, *wherein*

- at least one percolation path extends along the length of said tape, said path consisting of superconducting grains of said compound,
- the majority of said superconducting grains in said path have a shape such that their projection, being characterized by a length L_{par} parallel to the longitudinal extension of the superconductor and a length L_{per} perpendicular thereto, has an aspect ratio $a = L_{par}/L_{per}$ exceeding 1.5, the said high aspect ratio of said superconducting grains is obtained by selecting an appropriate microstructure of said substrate, in particular by selecting an appropriate microstructure of said substrate's surface onto which said superconducting grains are grown, and
- the total volume V of superconducting grains that are members of such one or more percolation paths exceeds 10% of the volume of said superconducting compound of said tape.

2. The superconductor of claim 1, *wherein*
at least 95% of the superconducting grains have the shape with the desired high aspect ratio $a = L_{par}/L_{per}$.

3. The superconductor according to any preceding claim, *wherein*
the microstructure of the substrate consists of substrate grains with a high aspect ratio on the surface of said substrate.

4. The superconductor according to claim 1, *wherein*
the substrate contains a buffer layer or buffer layer system of any arbitrary microstructure, whereby the desired high aspect ratio of the superconducting grains is obtained by an appropriately selected microstructure of said buffer layer, in particular by the microstructure of the surface of said buffer layer.

5. The superconductor according to claim 4, *wherein*
the microstructure of the buffer layer system consists of buffer layer grains with a high aspect ratio on the surface of the buffer layer at the interface to the superconductor.

6. The superconductor according to claim 4, *wherein*
the buffer layer system consists of a single layer only.

7. The superconductor according to any preceding claim, *wherein*
the aspect ratio $a > 4$.

8. The superconductor according to any preceding claim, *wherein*
the total volume $V > 25\%$.

9. The superconductor according to any preceding claim, *wherein*
the superconducting compound is a polycrystalline multilayer arrangement whose layers have different compositions.

10. The superconductor according to claim 9, *wherein*
at least one polycrystalline superconducting compound is directly deposited on the substrate.

11. The superconductor according to any preceding claim, *wherein* at least one superconducting compound is a cuprate.

12. The superconductor according to any preceding claim, *wherein* at least one superconducting compound belongs to the $ReBa_2Cu_3O_{7-\delta}$ family, Re being a rare earth including La or Y.

13. The superconductor according to any preceding claim, *wherein* the grains are aligned such that the average misorientation angle is below 20°.

14. The superconductor according to any preceding claim, *wherein* the average misalignment of the a-axis of the grains is below 20°.

15. The superconductor according to any of the claims 1 to 3, *wherein* the substrate is a metallic tape such as steel or a Ni alloy with a thickness in the range of 20 to 100 μm, whose surface grains are appropriately aligned.

16. The superconductor according to any of the claims 4 to 6, *wherein* the buffer layer system comprises a plurality of sublayers such as CeO_2/YsZ/CeO_2 and/or the superconductor is of the $ReBa_2Cu_3O_{7-\delta}$ family, Re being a rare earth, including La or Y.

17. A method for making a long superconductor, e.g. a tape or wire, by depositing at least one polycrystalline superconducting compound onto a substrate or onto a buffer layer system of said substrate, *characterized by*

- producing at least one percolation path along the length of said superconductor, each said path consisting of superconducting grains of said superconducting compound, by growing said superconducting grains on a preselected microstructure of said substrate such that
  - a majority of the superconducting grains is aligned along the longitudinal extension of said superconductor,
  - the majority of said superconducting grains in said path have a shape such that their projection, being characterized by a length L_{par} parallel to the longitudinal extension of said superconductor and a length L_{per} perpendicular thereto, has an aspect ratio $a = L_{par}/L_{per}$ exceeding 1.5 , and
- the total volume V of superconducting grains being members of such one or more percolation paths exceeds 10% of the volume of said superconducting compound on said superconductor.

18. The method according to claim 17, *wherein*
the buffer layer system is provided on the substrate, the latter being of arbirtrary structure, and the superconducting grains are grown on a preselected microstructure of the top layer of said buffer layer system.

18. The method according to claim 17 or 18, *wherein*
the growing step is executed by controlling the microstructure of the substrate or of the top buffer layer, in particular by mechanical treatment for producing small grooves in the surface.

19. The method according to claim 17 or 18, *wherein*
the microstructure of the substrate or the top buffer layer is controlled by

atom-beam or ion-beam treatment.

20. The method according to claim 17 or 18, *wherein*
the microstructure of the substrate or the top buffer layer is controlled by polishing the surface.

21. The method according to any of the claims 17 to 20, *wherein*
the microstructure control steps are executed and/or repeated until an average angular misorientation of less than 15° is achieved.

22. The method according to any of the claims 17 to 21, *wherein*
the superconducting compound is deposited from the vapor phase.

23. The method according to any of the claims 17 to 21, *wherein*
the deposition of the superconducting compound or is performed from a solution.

24. An at least partly superconducting object, in particular a wire or cable, *comprising*
a superconductor according to any of the claims 1 to 16 and/or fabricated according to any of the claims 17 to 23.